DR. PLAYFAIR'S LECTURE ON WATER SUPPLY.

On the 26th November Dr. Playfair lectured at the Museum of Practical Geology on Water Supply, chiefly in refereuce to the metropolis. The lecturer commenced by reviewing some of the conclusions arrived at in a previous lecture. When heat is withdrawn from water, it diminishes in volume until the temperature reaches 39·1°, when it begins gradually to expand, reaching its greatest expansion at the temperature of freezing, or 32°. The minimum volume of water, therefore, is at a temperature of 39·1°, this being the result of a series of experiments made by himself. The specific gravity of water at 60° being unity that of ice is ·9184, as determined by himself, which agreed precisely with the result arrived at by some other experimenters. When water is frozen, the air and salts are expelled, so that ice is perfectly pure solid water. In wells and springs the water contains air and gaseous bodies, besides alkaline salts. The lecturer then referred to the section of a hill consisting, at a certain depth, of a porous stratum like sand or gravel, succeeded by one of clay, by which the water is dammed up, and which will yield water on sinking a well down to it. Under the same conditions water will frequently break out in springs at the point above the clay where the latter crops out on the slope of the hill. The ingredients in water are of three kinds: earthy, alkaline, and organic. There are six different kinds of earthy ingredients, namely,—first, ordinary carbonate of lime, which is not naturally soluble in water, but is so in water containing carbonic acid; second, sulphate of lime or gypsum, which is itself soluble in water; third, chloride of calcium; fourth, carbonate of magnesia; fifth, chloride of magnesium; and, sixth, sulphateof magnesia or Epsom salts. The alkaline constituents are common salt, sulphate of soda, carbonate or bi-carbonate of soda, chloride of potassium, carbonate of potash rarely, and sulphate of potash frequently. Chlorate of barytes discovers sulphuric acid in water. To discover and precipitate the lime, oxalate of ammonia is to be added; and, in hard water, chlorate of lead causes a white precipitate. The alkaline constituents are those which chiefly concern hard water. On rubbing a drop or two of water between the finger and thumb, hard water may be readily detected, by observing that it scarcely moistens the fingers, but runs off, whereas soft water sensibly moistens them. The lecturer here drew attention to a large jar containing 1,000 grains of common London pipe-water. On adding to this a solution of soap, in spirits of wine, no lather is produced, and even after considerable shaking the lather still refuses to form; and this absence of lather continues until solution of soap is added in sufficient quantity to decompose all the earthy salts. Soap is an oily acid united with an alkali, generally with soda, the composition being margaric acid + soda. When added to water, the margaric acid leaves the soap and combines with the lime, forming margarate of lime. When the lime is decomposed, then, and not till then, a detergent lather will be produced. In comparing specimens of water having different degrees of hardness, the quantity of a solution of soap of a given strength required to form the lather should be measured, and so the degree of hardness may be determined. The London pipe-water has 14° of hardness. In washing the hands with London pipe-water you get up the lather outside the basin, and never in the basin; but in soft water you form the lather in the water, and, in fact, a detergent lather is immediately produced on the surface. Before 1,000 gallons of London pipe-water can be made detergent, 30 ounces of soap must be consumed. The average consumption of soap throughout England is 7½ lbs. per head of the population, whereas the consumption in London is 15 lbs. per head. The loss to the inhabitants of the metropolis from this cause alone,—namely, the extra consumption of soap—is probably not less than 200,000*l.* per annum. We try to economise soap in London by adding soda to soften the water.

After boiling, water is much softer than before, containing only 4 degrees of hardness. The value of the soda consumed in London for the purpose of mixing with water amounts to 30,000*l.* annually. The washerwoman is a more important member of society than the wealthy cotton spinner. A dozen shirts may be bought for 4*l.*, and, with economy, will last for three years; and supposing that three shirts are washed per week, at a cost of fourpence for each shirt, the washerwoman's interest in the twelve shirts will, at the end of three years, have amounted to nearly 8*l.*, while that of the spinner has been only 4*l.* It may be estimated that persons living in London with moderate incomes, say 600*l.* a year, spend one-twelfth of it, or about 50*l.*, in washing. Supposing that the washing of each individual amounts on the average to 1*s.* per week, the whole cost of washing, as paid by the inhabitants of London, will amount to 4,200,000*l.* per annum. The prices of washing in the country, where soft water is employed, do not exceed one-half of those paid in London; so that it appears an annual outlay of two millions sterling is occasioned to the metropolis by the hardness of the London water. In washing on the large scale, as in the process of washing clothes, you must make the whole of the water detergent, either by means of soap or by soda. The labour also of washing in hard water is much greater. The wear and tear of clothes is also excessive when hard water is used. It has been estimated that in the article of ladies' collars alone a destruction to the amount of 20,000*l.* takes place annually from the employment of hard water. The water at present supplied to London may be rendered soft by very simple chemical means,—namely, by adding caustic lime. The proportions required are one part of lime water to five of common water, and this reduces the hardness to the same degree as that of water after being boiled. In fact, water so treated contains only 4 or 5 grains of carbonate of lime per gallon, instead of 14 or 15 grains. The sharp, pungent taste in spring water is chiefly due to carbonic acid. Many persons complain of the insipid taste of perfectly pure soft water. The freshness may, however, be immediately restored to soft water by adding a little soda water, which supplies the carbonic acid. The annual expenditure or loss to the metropolis from the use of Thames water would, in the course of two or three years, pay for bringing it even from a distance of 50 miles. It was objected before the Parliamentary committee which lately sat on the water supply, that if you remove the saline ingredients from water it would no longer furnish the phosphate of lime necessary to form the bones. The absurdity of this idea was well exposed by Dr. Clarke, of Aberdeen, who said "the water of my native town (Aberdeen) has only one degree of hardness, and certainly the Aberdonians are amongst the largest boned men in her Majesty's dominions." In calico print works hard water cannot be used, and it is highly injurious when employed for steam boilers. The process of softening water by means of caustic lime has been tried and found perfectly practicable at the Chelsea Water-works.* One pound of chalk when calcined will produce 9 oz. of caustic lime, which will make 40 gallons of lime water, and be sufficient to mix with 560 gallons of ordinary London pipe water. From this calculation it follows that 31 tons of chalk daily burnt into lime would be sufficient to soften all the water used in London. It has been asserted that soft water acts injuriously upon lead, and that the presence of lead can be detected in soft water which has been kept in leaden cisterns by the addition of sulphate of ammonia. This latter is a delicate test for lead, throwing it down in a faint black precipitate. In order to test the truth of this assertion, Dr. Playfair had prepared a number of bottles, each containing a piece of lead immersed in water containing specimens of all the salts found in the London water, and also in water free from these salts, or perfectly soft. These bottles were sealed up in January last, and the action of all the water containing salts was very apparent, while the soft water had not acted on the lead at all.* As an example of those which had no action on the lead, the lecturer specially alluded to the Wandle water, one of those proposed to be brought into London, and well known for its remarkable softness. Where common salt is present in water, the action on lead is considerable. All his experiments tend to prove that perfectly soft water has no action on lead, and that all the solid ingredients of water tend to produce and increase the action of lead. Hard water often produces diseases in animals, and all who have watched the habits of horses and other domestic animals, must have observed how generally they will prefer even a dirty pool of soft water to the cleanest and freshest hard water that can be given to them. The same remark applies to poultry, pigeons, and other birds, who all select soft water when left to their own choice. The question of domestic economy, however, is so important to the inhabitants of London, that on that ground the battle of the water supply must be fought in the next session of Parliament.

* Dr. Playfair probably refers to the trials made during the last summer at the reservoir in the Green Park, when the water was rendered perfectly soft by the addition of caustic lime. We know of cases in which the same method is now regularly and successfully adopted in household practice—of course on a small scale.

* We believe that the assertion, or at least the truth, is, so far as regards the hard water, not so much that it will not act on the lead, as that, so acting, it forms, with the lead, a crust which protects both the water and the lead from further action. We may also add, that it has been explained by us heretofore that the action of soft water arose, not from the water itself but from free carbonic acid dissolved in it,—perhaps, too, even from ammonia so frequently got in rain water. Thus *soft water* will *not* act *per se* on lead; but the free carbonic acid with which it is so frequently impregnated will.

THE MARYLEBONE LITERARY AND SCIENTIFIC INSTITUTION.

The old lecture theatre of this institution, which was behind the premises in Edward-street, Portman-square, has been reconstructed and enlarged, and a gallery added: the arrangement, too, has been altered, the lecturer being now placed upon a raised platform at the back, and the benches for the auditory arranged concentrically upon a gradual incline in front of it, so that persons in the back seats have a full view of him. The main approach has been enlarged, and increased facilities given, with separate lobbies and staircases for approach to the ordinary and reserved seats, platform, and gallery, which, it is calculated, will now accommodate about 1,000 persons: there are also beneath the theatre four spacious class-rooms, with lecturers' retiring-room and other conveniences. The cost is about 1,200*l.* The interior is not yet complete as respects the decorations. Provision for warming has been made by a Nott's Patent Stove placed centrally, and ventilation is carried on by the introduction of tubes beneath the floor communicating with the exterior, and having outlets in the gangways for the admission of fresh air, the impure being carried off through the upper part of the lanthorn light, and by means of flues in the walls. Mr. C. Eales has acted gratuitously as the architect, and Mr. Hall, of Orchard-street, was the contractor.

ROYAL SOCIETY'S ANNIVERSARY.—At the anniversary meeting of the Royal Society, on Monday, the 1st St. Andrew's day falling on Sunday), Lord Rosse, the president, in the place of his ordinary address, read an admirable and interesting memoir on the progress of the science of comparative anatomy, exemplified by the works of Professor Owen, to whom the Copley medal (the highest honour the society has to bestow) had been awarded. The memoir was drawn up by Professor Thomas Bell, and, commencing in 1832, when Mr. Owen took up the mantle of the great Cuvier, recounted and analysed his numerous and important works.

PLAY GROUNDS FOR THE PEOPLE.—A petition to the Commissioners of Works from the clergy and medical men of St. James's parish, is now in course of signature, praying the commissioners to set apart a space in Hyde-park and elsewhere for the exercise of quoits and other athletic exercises.